



Information Communication Technology for enhanced credit Facilitation decisions for Agricultural Cooperatives in Uganda

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IJOTM

ISSN 2518-8623

Volume IV. Issue I

pp. 1-22, June 2019

ijotm.utamu.ac.ug

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Abstract

This paper unveils that problem grounded Information Communication Technology based solutions (ICTs) can enhance credit facilitation decision making that can ultimately improve financial Performance in Agricultural Cooperatives. This paper is motivated by two issues. Firstly, that the current financial performance measured in terms of loan portfolio, liquidity ratio and non-repayable loans is a result of decisions made in credit facilitation by cooperative managers in Uganda. Secondly that Information Communication Technology can provide an innovative mechanism which is theoretically grounded, and can improve the way of working of credit facilitation in agricultural cooperatives. This innovative ICT mechanism is called a Decision Enhancement Credit Facilitation Approach (DECFA) which is capable of enhancing the decisions of the credit facilitation process. The design of the DECFA was two- folded that is translating credit facilitation decision challenges into credit facilitation decision requirements. The requirements were translated into case scenarios which were presented as user case diagrams. These user case diagrams were translated into suites that were implemented in a studio environment. The design of the user case diagrams was done using the Unified Modified Language (UML). A fully designed DECFA can enhance credit facilitation decisions in agricultural cooperatives and it's supported by information communication technology.

Key words: *Credit facilitation decisions, agricultural cooperatives, Financial Performance, ICT*

Introduction

Smallholder agriculture in Uganda is argued to remain important for economic development through poverty reduction but its development is challenged by the need for institutional innovations to overcome financing failures (World Bank, 2014). There is growing interest from researchers (Murithi, 2014; Yogo et al. 2016), donors (World Bank, 2014) and government (Munyambonera et al. 2012) that cooperative organizations are institutional vehicles to improve smallholder agricultural production, particularly through improved financial accessibility for these smallholder farmers (Kwapong & Korugyendo, 2010). Cooperatives by definition are autonomous associations of persons united voluntarily to meet common economic, social, and cultural needs and aspirations through a jointly owned and democratically controlled enterprise (ICA, 1995). Due to their democratic and locally autonomous nature, cooperatives have a potentially strong role in reducing poverty, and promoting rural and national development (Develtere &

Pollet, 2008). But also, cooperatives are financially concerned with the ability to extend credit to their members. It is for this reason that cooperatives have been promoted virtually in all African countries since after colonial period (Wanyama, 2010).

The agricultural cooperatives terrain in Uganda; between 1950 to 1970, was that the cooperatives were at their peak of flourishing, financially they presented their highest sales volume and ratio of the produce they handled compared to the other agricultural produce handlers (UNDP, 2016). Research indicates that by 1965, the total value of agricultural produce sold through co-operatives was Uganda Shs. 325,311,500.5, with co-operative unions handling 267,420 bales (61%) of 437,923 bales, 40% of the Robusta coffee (valued at Shs. 60 million) and 90% of the Arabica coffee valued at Shs. 30 million (UN-Sacco, 2015). This was attributable to reliable credit financing decisions by the colonial masters and cooperative structures at the time (UNDP, 2016). The years that followed led to withdrawal of colonists as their era had ended. This led to a drop in the performance of the cooperatives to the point of bankruptcy for many of them. This time was also characterized by inability to extend financial assistance to their farmers, because of collapsed decision structures in the cooperatives that had previously depended on colonial decision support structures. During that period the farmers suffered financially which resulted into the worst production and sale of cash crops that greatly affected the GDP of Uganda. These challenges as opined by (Msemakweli, 2012) made farmers agree that cooperatives were the only realistic solution to their financial crisis at the time. The period of 1990s to- date has seen revitalization of agricultural cooperatives in Uganda, there are 16,408 registered cooperatives in the country and 1,014 of these were registered in 2015 alone (MTIC, 2016).

The cooperatives' empowerment has assisted its members through enabling access to economic and social services i.e. financial services, delivery of inputs to farmers, access to markets, enhancing small scale producers "bargaining power, and imparting skills for better production and marketing services. The question however, that remains unanswered is how are these cooperatives structurally prepared to maintain efficiency in credit facilitation amongst other services being provided. Munyambonera et al., (2012) specifies that improving credit facilitation structures for rural agricultural cooperatives is no longer debatable but essential for efficient credit supply for the farmers and this ultimately will improve performance. UNPD, (2016) contends that there are structural challenges in agricultural cooperatives in Uganda even though they uphold a good will to extend credit to the farmers.

Important to note is that there is a growing body of knowledge emphasizing the utilization of ICT theoretically grounded solutions as processes and products that can counteract the decision challenges in unstructured organizational systems. This school of thought is termed as decision enhancement (DE) as defined by Keen & Sol (2008). DE provides services to guide a journey where managers in multi-disciplinary fields and technology come together to make a substantive new impact on effective decision-making in any organization. Thus, a decision enhancement approach with well-developed suites and personalized guidelines is a useful tool for decision- making and is useful in improving decisions made in credit facilitation that will ultimately improve financial performance in agricultural cooperatives. DE has evidence of solving decision issues in other areas, such as Business process agility (Amiyo, 2012), Starting a miner's enterprise (Ejiri, 2012), Public service (Knol, 2013), Health(Mirembe, 2015), Market and Price for farmers (Aregu, 2014) and Asset management (Katumba, 2016).

With the above evidence of the operation of DE the question remains on how can credit facilitation decision challenges be solved in agricultural cooperatives using ICT? To address this question there was extraction of the decision enhancement requirements and the design of the approach. This research is theoretically grounded on what other researchers have done in the areas of decision enhancement and presented in the next section.

Theoretical Review

Agricultural cooperatives are a type of farmer organizations with distinct characteristics differentiating them from other farmer organizations. As the unit of analysis for this paper, there is a need to emphasize that cooperatives top performance agenda is to extend relevant services to its members in accordance to the purpose of forming them (ICA, 2016). Therefore, in credit providing cooperatives, ability to extend credit when it is required is a priority. In line with the cooperative priority, credit facilitation processes cannot be divorced from decision making. Gupta, (2011), noted that credit facilitation is a process that involves credit capital sourcing; credit terms determination and screening and credit reporting. And each of these sub- processes is a decision unit and its decisions will affect the entire process if not optimally taken. In a structural challenging set up, trampling into the decision weakness zone is unavoidable. And because of the above, this paper was grounded on decision making theories and the Service Oriented Architecture Theory (SOA).

Mintzberg et al., (1976), and Simon, (1997) argue that decision making facilitates information search on the problem to be solved. Providing possible alternatives, evaluating these different alternatives and choosing the most viable alternative as well as controlling the alternative decided upon. March, (2010) suggests that decision making is characterized by rationalistic and bounded rationality models. Rational decision making implies that the decision maker operates under certainty, has several alternatives with their related outcomes. He is conversant with the decision criteria and has the ability to make an optimum choice to implement (Towler, 2010). In reality, however the situation is such that most decision makers operate in uncertain and complex business environments (Katumba, 2016); such is the norm in the agricultural sector (Aregu, 2014) that anchor agricultural cooperatives. While examining the context of credit facilitation in agricultural cooperatives, structural decision challenges of credit facilitation portray the complexity of the agricultural cooperative in the business environment. These challenges undermine agricultural cooperative managers' ability to make rational decisions.

In the above situation of inability to make rational decisions, cooperative managers use heuristic rules in decision making to simplify highly engaging tasks into simpler ones. The heuristic rules work hand in hand with Jager & Janssen (2012) proposed *consumat*. This *consumat* proposes a set of four decision strategies based on their consumers' studies: a) repetition (do as you always do), b) imitation (do as your close peers do), c) inquiring (study what all peers do and do as the majority do), d) optimizing (calculate all alternatives and choose the best). The study assumes that in the absence of information requirement for rational decision making cooperative managers either repeats what they have done before, benchmark on what other cooperatives are doing, make an inquiry from an authority or optimize amongst available options. Utilizing the proposed *consumat* leaves the cooperative manager who is an agent with a dilemma of focus on the decision process and dependent on the stakeholder's views which contravenes. Mintzberg et al., (1976) recommendation in decision making discussed above that "decision making ends when a final decision that has made can be evaluated. Therefore, the two issues of decision processes and final evaluated decisions discussed are important for enhancing credit facilitation decisions in agricultural cooperatives.

With the proposed decision enhancement approach and the theoretical review discussion at hand. It is noted that most of the decisions made in credit facilitation ought to be made in a logical way as per the credit facilitation processes. These are best done in the context of an institution of credit while engaging with decision stakeholders who ought to be facilitated with sufficient information (Mintzberg et al., 1976). These decisions done ought to be evaluated in order to check their level of efficiency in addressing the institutional user needs. It's against this pretext that the service oriented architecture (SOA) was deemed relevant for developing this decision enhancement approach. That can assist credit facilitation managers improve on their processes of work. The service oriented architecture is discussed in the paragraph that follows.

The service-oriented architecture (SOA) enables creation of management and financial information systems, and their components that can be modular, accessible and interoperable (Van de Kar and Verbraeck, 2007). Systems developed using SOA can be achieved by utilizing organizational existing assets and applications as services to integrate business processes and needs. SOA's approach facilitates agility in the business by aligning support technologies with organizational business needs. Within the SOA perspective, a “*service*” is an abstract resource that represents capabilities of performing tasks, as well as representing a coherent functionality from the point of view of provider and requestor (Van de Kar and Verbraeck, 2007). Developing a decision enhancement credit facilitation approach for the cooperative managers requires several services to be identified and put in use, and this may involve different capabilities and technologies. Using the SOA principle, services required can be common and sharable among participants. For instance, a particular service request capability can be used by all stakeholders from different locations to meet sometimes different decision-making needs. This added advantage of supporting collaboration amongst the users strongly enabled relevancy of the theory to solving the theoretical gaps identified.

With the theories' discussion above, it is justified that developing a decision enhancement approach for credit facilitation in agricultural cooperatives can improve financial performance. This can be a solution to the decision challenges faced by managers in agricultural cooperatives.

Methodology

The methodology of this paper was two folded: Firstly, to extract the decision enhancement credit facilitation requirements, for agricultural cooperatives in Uganda. An exploratory study was conducted in six agricultural cooperatives spread out in three districts in south western Uganda in 2018. These were selected purposively on a case study basis as recommended by Zainal (2007), that case study method is best suited for exploration studies' in-depth investigations. A mixed research approach was employed with both quantitative and qualitative methods of data collection. Survey and focus-group discussion methods were used, with a questionnaire and focus-group discussion guide as the instruments. Quantitative data collected was triangulated by the qualitative data. A total of 113 respondents were involved in the study composed of cooperative managers and members. Data collected was in relation the explaining the credit facilitation decision challenges affecting financial performance in agricultural cooperatives in Uganda. The challenges confirmed were translated into decision enhancement credit facilitation requirements.

Secondly to design the decision enhancement credit facilitation approach, the design process was hinged on the seven principles for inquiry systems as advanced by Gonzalez et al., (2012). With an implication that the DE requirements identified had to: have a purpose of creating knowledge; measure of its performance in societal; ensure the client is humankind; knowledge should go outward to have utility; the inquiry system had a need in cooperative environment; ensure that decision-makers involve all the stakeholders; and the designers were stakeholders too. These principles, guided the design of the models which were done using the Unified Modified Language (UML), a diagrammatic notation for modelling systems using object- oriented concepts. This design methodology was systematic in undertaking and involved modeling from use case, activity flow, activity sequence and how components within the models would work together to achieve the final goal. Gonzalez et al., (2012) emphasize activity diagrams as the graphical representations of workflows of stepwise activities with special consideration to choice, iteration and concurrency. Activity diagrams helped to model the credit facilitation processes decisions. The outcome of this process was a model that was fitted into different suites to create the Decision Enhancement Credit Facilitation Approach, which took care of the DE requirements for the Approach. To implement the decision enhancement approach into a decision enhancement approach for credit facilitation, at Suite level was done using HTML5, which was supported by JavaScript for the client side and PHP/MySQL/ Apache for the server side.

Results and Discussions

The Extraction of Decision Enhancement Requirements for Credit Facilitation

Results from the exploratory study showed that: A response rate of 82% was registered with a total of 102 respondents participating in the study. Data on credit facilitation decision challenges that affect financial performance in agricultural cooperatives was analyzed descriptively and using inferential statistics (correlations). A summary of descriptive findings triangulated with qualitative findings indicated the following:

That even though (Ombado, 2010) recommends the importance of credit capital sources, the descriptive findings, showed that cooperatives operate ill-structured processes in setting the cost of subscription that undermine the manager' involvement. As well as limited involvement of stakeholders in the entire credit capital sourcing decision processes. That while selecting the provider for external credit, there is lack of a chronological order to be followed while making external borrowing decisions. This partly explains the irrational mode of decision making and the consequences of this have lasting effects on the financial performance of the cooperatives. The findings also present the gap that users lack an appropriate solution to decide the most suitable source of credit capital due to insufficient information availed on the source. This contradicts the recommendations of Onyango, (2016) who emphasizes the importance of external financing for an agricultural cooperative.

Observed too was the decision challenge of lack of a logical and systematic flow of activities as per the specified strong factors loaded in the anova for credit capital sourcing. The descriptive and qualitative findings confirmed that even though these duration decisions are vital, there was not specific order observed while these decisions taken. This was observed in Nyabbani, (2017) input on their depositing part payment at the next meeting, which lacked scientific logic. This decision gap needs enhancement. The findings on credit limits and lending rate decisions confirmed that there was no structure and sequence to be followed setting the credit limit, which is an urgent challenge that needs a solution. A standard application as noted by Danso, (2015) is important to ensure that standard requirements are captured from borrowers to enable agricultural cooperatives officers decide on the most suitable persons to qualify for credit. This is yet another gap that needs enhancement.

From the credit reporting, as supported by Experian, (2017), it was noted that a notification guideline and a credit notification guideline are vital in making credit facilitation decisions. However, these two guidelines were lacking in the case of the Ugandan Agricultural Cooperatives, this was a challenge to credit facilitation decision making. Therefore, cooperative managers as decision makers ought to overcome these challenges in order to flourish the financial performance of the agricultural cooperatives.

The objective had two variables that are credit facilitation decision challenges and financial performance. Therefore, it was necessary to run bivariate statistics (correlation analysis). This further revealed a positive significant relationship between credit facilitation decisions and financial performance. The correlation findings are presented based on each sub variable and they are as follows:

For credit capital sourcing decisions, the $r=0.503^{**}$ indicated a positive relationship between credit capital sourcing decisions and financial performance hence an improvement in credit capital sourcing decisions would lead to an improvement in financial performance. A p-value of (0.033) is lower than (0.05) which means that the relationship is significant as per Figure 4-1.

Figure 4-1: Correlation coefficient showing a relationship between credit capital sourcing and financial performance

Correlations			
		Financial Performance	Credit Capital Sourcing decisions
Financial Performance	Pearson Correlation		
	Sig. (2-tailed)		0.033
Credit Capital Sourcing	Pearson Correlation	0.503*	1
	Sig. (2-tailed)	0.033	
*. Correlation is significant at the 0.05 level (2-tailed).			

Source: Primary data 2018

For credit terms and screening decisions, the $r = 0.478^{**}$; p -value [0.000] indicated a moderate, positive and significant relationship between credit terms & Screening decisions and financial performance as showed in Figure 4-2.

Figure 4-2 : Correlation analysis for credit terms & screening decisions and financial performance

Correlations			
		Financial Performance	Credit Terms & Screening decisions
Financial Performance	Pearson Correlation	1	0.478**
	Sig. (2-tailed)		.000
Credit Terms & Screening decisions	Pearson Correlation	0.478**	1
	Sig. (2-tailed)	0.000	
**. Correlation is significant at the 0.01 level (2-tailed).			

Source: Primary data 2018

For Credit Reporting decisions, the $r = 0.485^{**}$; p -value [0.041] indicated a modest positive significant relationship between credit reporting decisions and financial performance as showed in figure 4-3.

Figure 4-3: Correlation Analysis between credit reporting decisions and financial performance

Correlations			
		Financial Performance	Credit Reporting decisions
Financial Performance	Pearson Correlation	1	0.485**
	Sig. (2-tailed)		0.041
Credit Reporting	Pearson Correlation	0.485**	
	Sig. (2-tailed)	0.041	

Source: Primary data 2017

All these correlations presented a positive and significant relationship between the credit facilitation decision processes and financial performance, the implication of these results is that, an improvement in the decisions of any of these credit facilitation decisions across the different processes will lead to a positive change in the financial performance of agricultural cooperatives. These findings are in agreement with Murithi, (2014) who confirmed the role of credit capital sourcing decisions as having a positive relationship with its financial performance. Therefore, in order to counteract the above confirmed

challenges that affect financial performance in agricultural cooperatives in Uganda, a list of decision requirements were extracted from the decision challenges explained before. The decision enhancement requirements extracted are as follows:

Decision enhancement should support the process of deciding on the cost of the membership subscription and equity sales. It was noted from Danso, 2015 and the exploratory study that even though the membership subscriptions are always not sufficient for credit capital but they provide sustainability for the cooperatives if optimal decisions are made.

Decision enhancement should provide a structured step by step flow in deciding on the external borrowing while capturing the different decisions of Manager Loan initiation, board approval, loan requirements verification and review of repayment structure.

Decision enhancement should support in determining the credit duration for the respective credit giving based on the major considerations of the cooperatives meetings and funds review.

Decision enhancement should support the determining of the lending rate for cooperative credit. This needs to be based on manager' initiation, cooperative meetings, charges review of other cooperatives and review of credit capital available

Decision enhancement should assist in setting credit limits based on the considerations of expected harvest and cooperative meetings.

Decision enhancement should be able to enable users to check for standardization of the applications based on adherence to membership requirements, authenticity of information provided and adherence to the set credit limit.

Decision Enhancement should provide an optimal technique for credit approval, basing on the credit purpose, credit history and adherence to the membership requirements.

Decision enhancement should provide a mechanism for setting monitoring guidelines based on credit repayment schedule and reviewing credit limit.

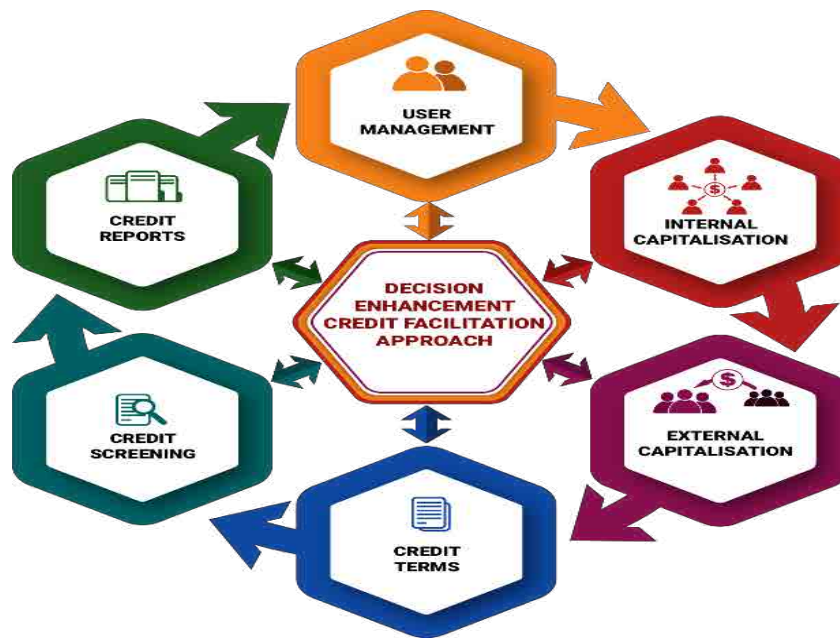
Decision enhancement should enable users to checking on credit repayment compliance based on payment schedules and value of collateral security.

Decision enhancement should be able to easy credit notification procedures for the members that have borrowed. This should be done through the DE' ability to send warning notification to borrowers and referees as well as setting dates for collateral attachments and bad-credit write off notifications.

4.2 The Design of the Decision Enhancement Credit Facilitation Approach

Venable et al., (2012) assert that a purposeful artefact is any kind of artefact designed to achieve a development purpose, the decision enhancement credit facilitation approach in the case of this study. Through literature review and the exploratory study, there was gaining of new, relevant concepts and key guidelines necessary for building the proposed DECFA. The figure 4-4 entails the main suites for the approach which include: user management, internal capitalization, external capitalization, credit terms, credit screening and credit reports and their interaction with the studio.

Figure 4-4: Decision Enhancement Credit Facilitation Approach (DECFA)



In order to design a suitable approach for the decision challenges of credit facilitation identified in the exploratory study above. The designing process was underpinned by seven principles for inquiry systems as advanced by Gonzalez & Sol., (2012). To complement the seven principles of inquiry system the design was principled on information systems, these are systems implemented in organizations for the purpose of improving performance (Hevner *et al.*, 2010). This study considered credit facilitation in agricultural cooperatives as an organizational system. This is because there are a series of related activities being carried out for the organization” common goal attainment (Handy, 1999). With specific interest to the agricultural cooperatives, there are activities in credit capital sourcing (internally and externally), credit applications, credit terms determination, credit appraisal and credit reporting, these supplement each other in order to realize optimal profit from the credit given out (Danso, 2015). With each of these activities having decisions that required improvement, information systems were realized as the most appropriate for the design process.

In the development, the manager’s ability and skill to use the designed DECFA were highly considered as recommended by (Churi *et al.*, 2012), the cooperative managers were mainly semi- educated in information technology, with low income levels which disenables their purchasing ability and use of these advanced technologies despite their advantages (Newman *et al.* 2000). This influenced the development of a simpler decision enhancement technology, that cooperative managers can easily get linked with all their relevant stakeholders. This linkage even quickens the credit facilitation and has a positive effect on the financial performance of agricultural cooperatives. The design of Decision Enhancement Credit Facilitation Approach followed the way of thinking, way of modeling, the way of working and the work of governance, (Selingmann *et al.* 1989).

In the way of thinking, arising from the concept of decisions support systems in agriculture (Selingmann *et al.*, 1989). The DECFA is an ICT based service system, which helps users to enhance decisions that are more effective by accessing information and collaboration opportunities. Hence, DECFA is considered a service system upon which we draw inspirations from various systems’ development theories .Service systems design is a complex activity that requires knowledge from several different disciplines inspirations were drawn from service system development as advanced by Van de Kar *et al.*, in 2007. Under this system development he specifies that: user needs translated into performance criteria and operational processes; information and communication technology that deliver the services, and the

inter-organizational setting needed to develop and deliver the service. The way of thinking also outlines the design contexts and the theoretical underpinnings of credit facilitation decision making process. In order to mitigate these factors, a Decision Enhancement Credit Facilitation Approach (DECFA) was proposed. The way of thinking defines the specific tasks and activities to direct the collaborative credit facilitation decisions for cooperative managers and in this particular case using DECFA.

DECFA is considered a service system that enhances decision making ability of stakeholders involved in credit facilitation decision processes. Consequently, from the perspective of decision enhancement services, DECFA comprises of three fundamental elements including people, technology and decision-making process. The people aspect is well explained through the underlying philosophy of design science. Design science defines an environment as the problem space in which the phenomena of interest resides. (Hevner et al. 2010) specifies that an environment is composed of people, organizations and technologies. Equally in the environment are problems and opportunities as perceived by the different users in the phenomena. Therefore, people are important and at the center of the design as the service systems often operate to link networks between the different users.

Therefore, designing usable systems requires knowledge of the likely users, their needs, capabilities and places of location (Aregu, 2014). And also relates to the human-computer interactions. The people in the study refer to cooperative managers involved in making credit facilitation decisions; cooperative members who provide membership subscriptions that are translated into internal capitalization and also come forth to seek the credit services; the AGM and the cooperative board members that authorize specific processes; the external lenders who provide external credit capital; the administrators that play a background role of maintaining cooperative information. Each of these users has specific decision challenges that relate to the process they are involved in. The DECFA therefore describes the interrelated credit facilitation decision making processes performed by the different users. The users of the DECFA are summarized in the figure 4-5 that follows:

Use case	Users
User Management	Managers Members Administrators Board representatives AGM representatives External Lenders
Internal capitalization	Managers Members AGM representatives Administrator
External capitalization	Managers AGM representatives Board representatives External Lenders Administrator
Credit Terms	Managers Board representatives AGM representatives Administrator
Credit Screening	Managers Administrator

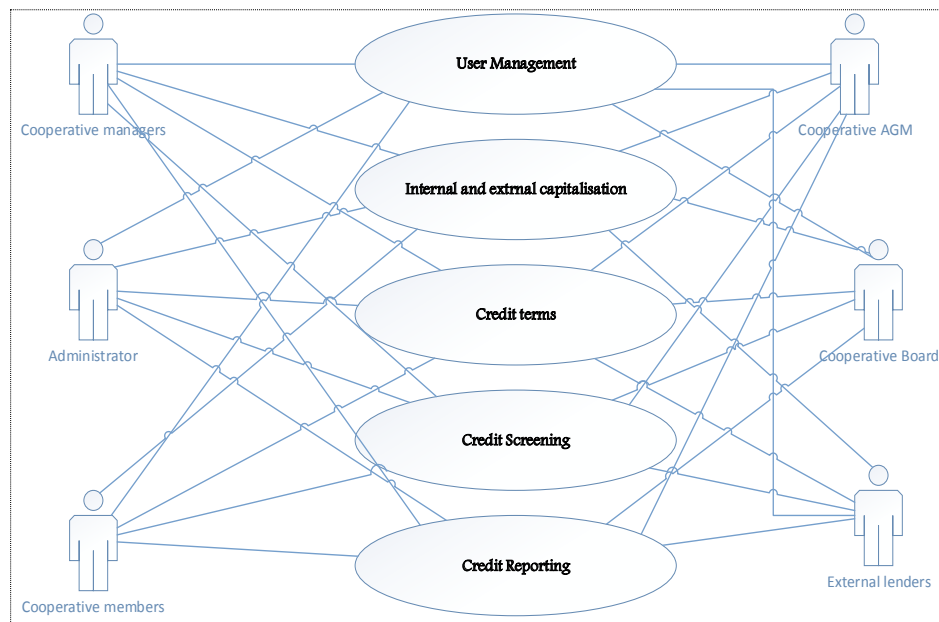
Credit Reporting	Managers Members AGM representative Board representative Administrator
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The aspect of technology is relevant to the design science philosophy underpinning the paper as it emphasizes the development of technology-based solutions and relevant to human problems (Hevner et al., 2010) in this paper's case, technology provides multiple types and levels of support directed to enhancing credit facilitation amongst the different stakeholders. Consequently, a number of enabling technologies for developing DECFA include internet, different telecommunication networks, and personal computers, among others. Specifically, these technologies provide a facilitative and collaborative environment (in the form of tools, hardware and software). However, research has also shown that technology can only be beneficial if it is used as a tool, which can be adjusted to combine additional knowledge and experience, and adopted within a local context (Ejiri, 2012) it is therefore, imperative that the quality of technology for enhancing credit facilitation decisions should be similar to the qualities of their goals: such as "local relevance, repeatability, sustainability and predictability" (Steinberg, 2003). The technology aspect may be realized through a collaborative approach of the studio with its relevant suites packed with relevant services and recipes. Consequently, our way of thinking is grounded on collaborative engineering (De Vreede et al., 2003), underpinned by deploying well-turned recipes (Ejiri, 2012) to aid the collaboration among credit facilitation participants.

The way of modeling on the other hand describes the models used in the suites of the DECFA. The models used in the DECFA were designed using the Unified Modelling Language (UML). UML is a notation (mainly diagrammatic) for modelling systems using object-oriented concepts (Larman, 1998). In addition, UML is a language for specifying, visualizing and constructing the artefacts of software systems (Larman, 1998). Given the many possible DECFA activities from requirements through to implementation, the author employed UML because it supports the prototype development process describing the possible order of activities that help in understanding the problem and requirements by stakeholders. The process of modelling started with development of the use case model.

Use cases describe processes. They are a useful preliminary step in describing the requirements of a system. Understanding the DECFA requirements included partly understanding the credit facilitation processes. In the DECFA, the user case begins with a cooperatives soliciting for credit capital as their core function is to provide credit to its members (Essendi, 2013). A use case diagram was used to envision the actors and their roles in the DECFA. The actors include Cooperative managers, cooperative members, cooperative board, and annual general meeting representatives, external lenders and administrators who influence credit facilitation decisions. Bittner (2002) states that use cases, allow one to describe the sequences of events which, when taken together, improves the usefulness of a system. The use case diagram provides a powerful way to express the behavior of the DECFA in a way in which all the actors in credit facilitation can easily understand. Access to the studio is defined based on the various roles performed relating to data and information on asset maintenance. Generation or editing of data is restricted to staff of the utility through access authentication: where public input is desired through social media. These are subjected to validation by staff before they are considered to do anything in the model. The figure 4.6 below presents that the different case users for the model.

Figure 4-6: User Case Diagram



The way of working describes the steps followed in using the DECFA to enhance credit facilitation decisions. This highlights the operation of the DECFA which is hinged on; how information is accessed, used and managed; how activities are coordinated; and how collaboration and communication between cooperative managers and the other stakeholders is handled. It explains how the DECFA can be explored by cooperative managers to access relevant information for enhancing credit facilitation processes. The DECFA also demonstrates how other stakeholders can utilize it to support the operations the cooperatives. As described in the previous paragraph, there are various users of the DECFA namely: cooperative managers, cooperative members, AGM representatives, board representatives, external lenders and administrators. Each of these users has a role they play in the DECFA and their roles are well illustrated in the six suites of the studio. These suites are presented in the figure that follows.

Figure 4-7: DECFA' Scenario roles and functionalities

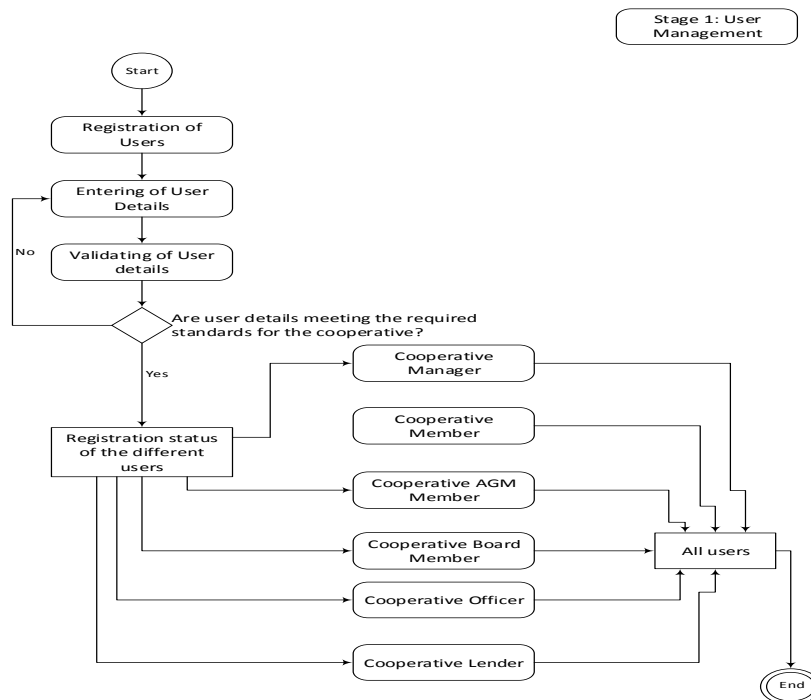
Scenario	Roles	Functionalities and services
User management	Membership recording, access management and records management	- Facilitates data capturing, recording and storage of users - Facilitate the specification of user log in capacity - Enable display of information in the system
External capitalisation	- Lender options/ companies - External Credit Terms - Discussion Forum - Borrowing Report	- Facilitates recording of lender options - Facilitates determination of external credit terms - Facilitates discussion of optimal lender - Facilitates recording of loan borrowed and its payment procedures - Facilitates reporting on the total credit capital available per season.

Scenario	Roles	Functionalities and Services
Credit Terms	- Internal Credit Terms - Loan Application Form - Loan Application	- Facilitates determination of the credit duration, interest rate and credit limits for the respective seasons. - Facilitates accessing the loan application Form - Facilitates expressing the principal amount required - Facilitates the computation of the interest rate based on the cost of external borrowing - Facilitates recording of the collateral security and its value in form of cash - Facilitates recording of the reference' contacts - Facilitates the loan application report that expresses internal capital versus loan applications.
Credit Screening	Screening Report	- Facilitates a summary on: » Member and loan requested » Interest rate charged » Expected Repayment amount » Collateral Value » Expected Harvest Income » Total Membership paid - Facilitates decision basis on qualification or non-qualification for credit applied for - Facilitates decision on approve or disapprove credit application
Credit Reporting	- Internal Loans status - External Loan status	- Facilitates a summary on: » Borrower name » Principle and interest rate » Total Repayment made » Loan Balance - Facilitates decision on compliance based on payment Status (on track or deficit payment) - Facilitates viewing of individual repayment schedules. - Facilitates comparative decision making through viewing the details on: - External sourcing provider - Principle and Interest rate - Update Repayment - Balance due - Loan period

Subsequent to the way of thinking described before and considering the derived requirements in section 4.1, six suites were identified to provide the required functionality of the studio. But equally the entry into these suites is made possible through the dashboard that provides a summary of what is underlying in the different suites presented graphically for ease in visualization. This credit facilitation studio helps actors in keeping track of the users, internal capitalization, internal capitalization versus loan applications, loan applications versus approved loans and the credit reporting status. The dashboard creates a meeting of minds through visualization. This visualization obviously is a distinct value in helping cooperative managers and appreciates the credit facilitation process. Comparisons and interpretations by cooperative managers are via visualization. The evidence is strong that visualization is at the very core of human decision-making. The DECFA is built with communication capabilities, development tools and visualization aids to support decision-makers in credit facilitation process. Enhancement rests far more on images that are most consequential, complex, and uncertain, and a shift from the design of computer- and telecommunications-based tools to a far more comprehensive studio' approach to the integration of

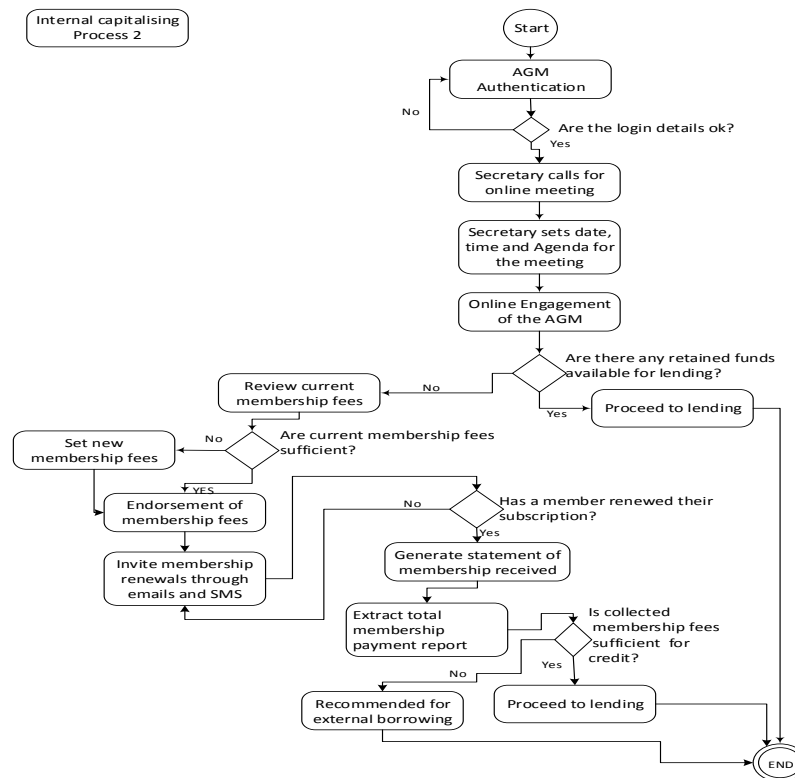
dynamic visualization and communicative display (Keen & Sol, 2008). DE enables shared visualization amongst stakeholders. DE enhances the link between people and technology in new ways, particularly through the DE focus on visualization. The six suites are user management, internal capitalization, and external capitalization, credit terms determination, credit screening, and credit reporting. Access to the approach implemented in the studio is defined based on the various roles performed relating to data and information on credit facilitation. Generation and editing of data is restricted to cooperative managers through access authentication: where members input their various requests. These are subjected to validation by cooperatives managers before they are considered; this suite is illustrated in figure 4-8 activity diagrams on user management.

Figure 4-8: Activity Diagram on User Management Suite



The suites of the DECFA open with the user management suite that provides a presentation of how a user gets to use the approach implemented in a studio. This suite provides a registration forum in which a given user has to register by providing their essential details. These details are then validated and the user can then receive access into the studio. DECFA provides a number of platforms in which a user can be registered and also get to use the studio, these include as a cooperative manager, cooperative member, cooperative administrator, annual general meeting representative, board representative and external lender. This suite is very vital because it regulates who access what information in the studio and who doesn't but also provides restriction on the kind of information each of the users' accesses dependent on their user registration.

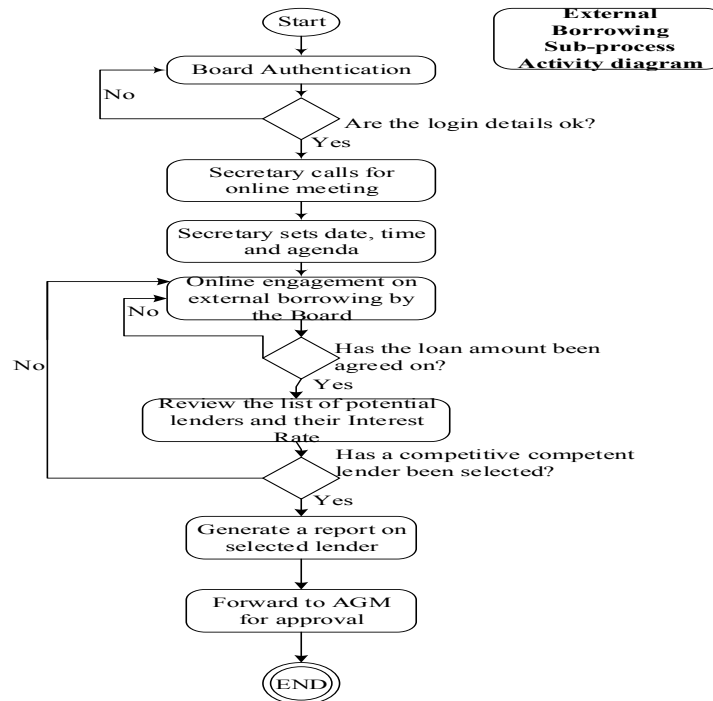
Figure 4-9: Internal Capitalization Suite



The second suite is Internal Capitalization; this suite deals with the membership subscription payments by the various cooperative members. It should be noted that as per section 1, that agricultural cooperatives are groups that bring together farmers to provide themselves with facilities that would have been expensive individually and one of these is credit. In order to raise capital to provide credit, cooperatives receive subscription from their members that they transform into credit. In order to pay this subscription fee, this fee has to be set, it is done on a discussion forum amongst the AGM and this is implemented by cooperative managers who receive subscription fees from registered cooperative members.

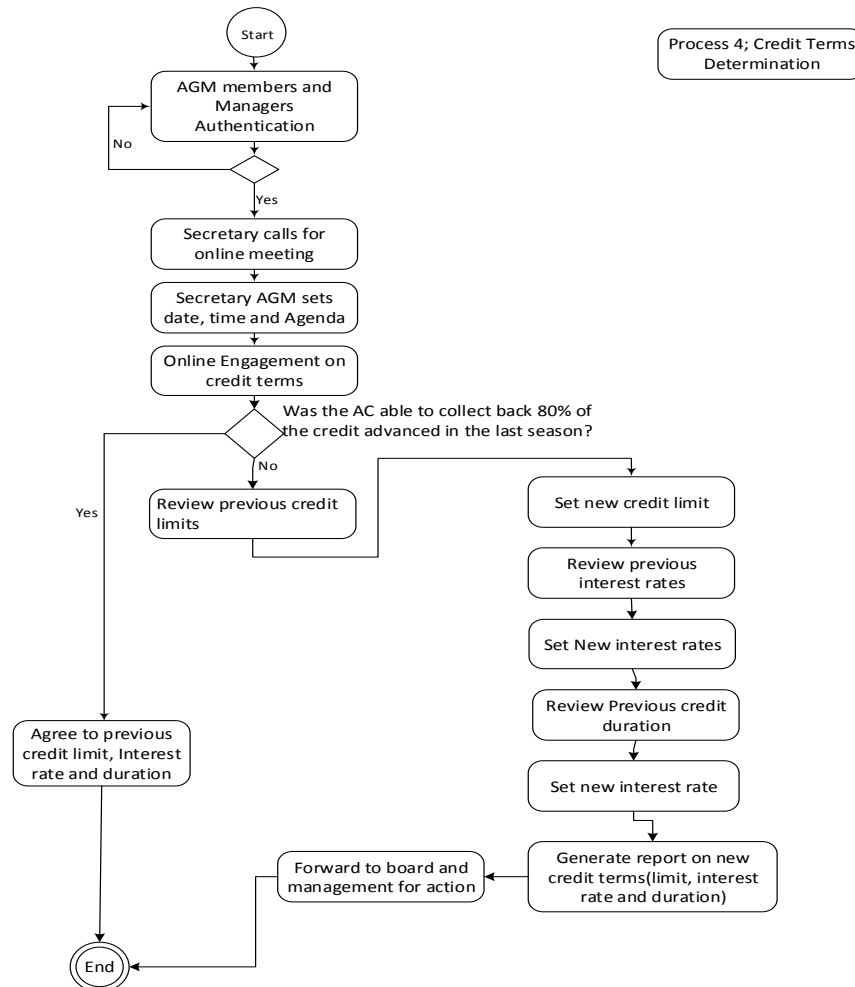
These members are already captured in the authentication suite. This implies that a non-member cannot be able to access the system which assists the managers to generate accurate records on how much has been generated in form of internal capitalization. This suite also records the members due versus how much of these members has been received at the cooperatives and this helps the members to easily keep track of the status of their membership payments. The suite also generates the report based on the various financial periods that is January to April, May to August, and September to December. This period provides responsible planning for the credit facilitation decisions to be made. Further still, the model illustrates that when members have subscribed, then managers can be able to compare how much has been received inform of subscriptions and the loans applications the cooperative has received. In case the loan applications are more than the amount collected in form of subscription, the studio recommends that the cooperative should be able to decide on taking on external borrowing. The graphical presentation of how this suite works is illustrated above in figure 4-10.

Figure 4-10: External Capitalization Suite



Other than Internal Capitalization, there is external capitalization as the other part of credit capital sourcing and as illustrated in internal capitalization. It occurs when the credit capital required is more than that collected from the membership subscriptions. In that case the manager raises authorization from the board on whether to proceed with external borrowing through an online discussion chat. Once an approval is given, the board will also have to provide a maximum to be borrowed. Danso, (2015) recommend that the amount borrowed shouldn't be more than 40% of the assets of the cooperatives and in this case the financial assets (membership subscriptions and retained earnings). Once the amount is set, there is selection of the external lenders which starts with looking for the external lenders alongside with their credit terms which are inputted in the system. Based on the inputted details of the lenders and their terms of Interest rate, repayment period and credit limit, the system preempts the most optimal lender and this is approved by the AGM members. The studio is therefore facilitating visualization of all the information required for selected a suitable lender to cooperatives, while reviewing their credit terms holistically. These two sub-processes for selecting and approving external lenders are illustrated in the figure 4-11 above.

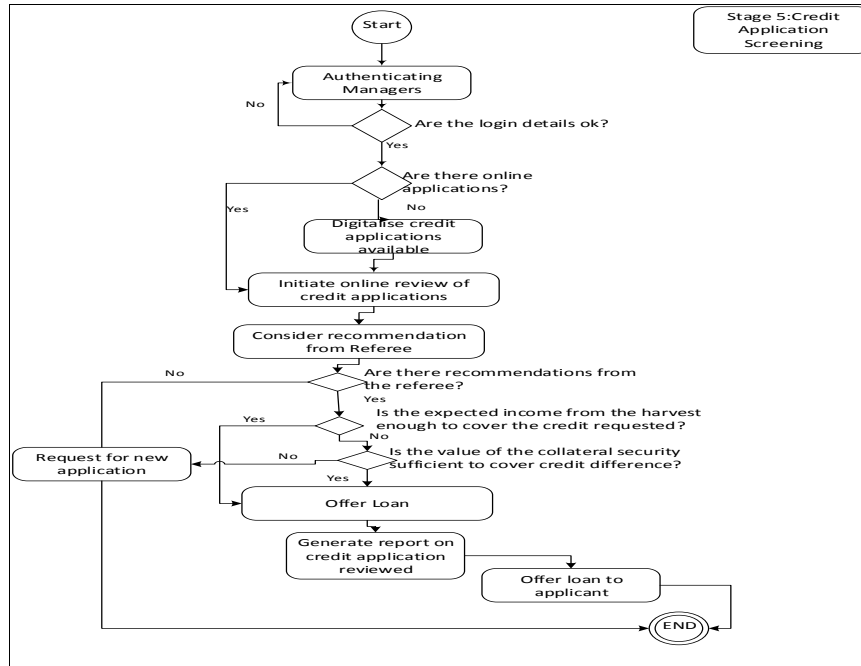
Figure 4-11: Credit Terms Determination Suite



In the model presented the AGM representative, board representative and manager get into the system and review their last season performance, based on collections. The team needs to be aware that there are two strands of settings the credit terms; these are dependent on whether the cooperative is purely utilizing internal capitalization or external capitalization. To be able to set the credit terms when the cooperative is utilizing internal capital, the team of AGM representative, board representative and manager meet and agree whether to revise the lending rate. This is dependent on if there was profitability based on the credit administered the previous season. If the previous period was profitable then, the cooperative can opt to maintain previous lending rate. In order to set the credit limit, the team refers to the meeting that sets the amount of loans to be issued as per the internal capitalization suite. The credit duration as established in the exploratory findings is should be dependent on the financial period for the cooperative. As established most the cooperative have three financial periods during the year and credit advanced has to fit into the respective periods.

If the cooperative is utilizing both internal and external capital, in a bid to set the credit terms the cooperative team need to be mindful of the effect that external capital plays in influencing the credit terms. A meeting amongst the AGM representative, board representative and manager that agreed on external lending as well as repayment terms, these are considered. To set the credit limit, the cooperative has to consider the number of loans budgeted and the amount set aside for each loan as the credit limit. To set the lending rate, the cooperative considers the interest rate of the external loan (Janda, 2013) plus a markup gap of 2%.amount as basis set in the capitalization suites(internal and external). The duration is fixed on the financial period. This ensures that the cooperative managers are able to realize the repayment of credit advanced within the timing to repay the external loan. This suite ends with invitation of credit applications as the credit terms have been set.

Figure 4-12: Credit Application Screening Suites



With credit terms set and the credit applications made, the studio presents the way of working of credit screening suite. This is graphically illustrated in figure 4-10. This suite was developed as a solution to ease decisions on vetting who qualifies for the credit and who doesn't. The suite starts by confirming who are the users are, this helps to ensure that only the specific users of this sensitive process are allowed in the suite. The cooperative managers then initiate an online review for all applications providing an entry of those applications not available online. In the online review of applications, the managers must consider three key requirements namely; recommendation from the referee, the expected income from the harvest in comparison to the total credit to be paid back and then the collateral security value. Out of this review a report is generated which clearly spells out if the applicants quality for the credit application or not. This sub-process in credit facilitation is very vital as it ends with dispatchment of credit facilities to applicants.

Figure 4-13: Credit Reporting Suite

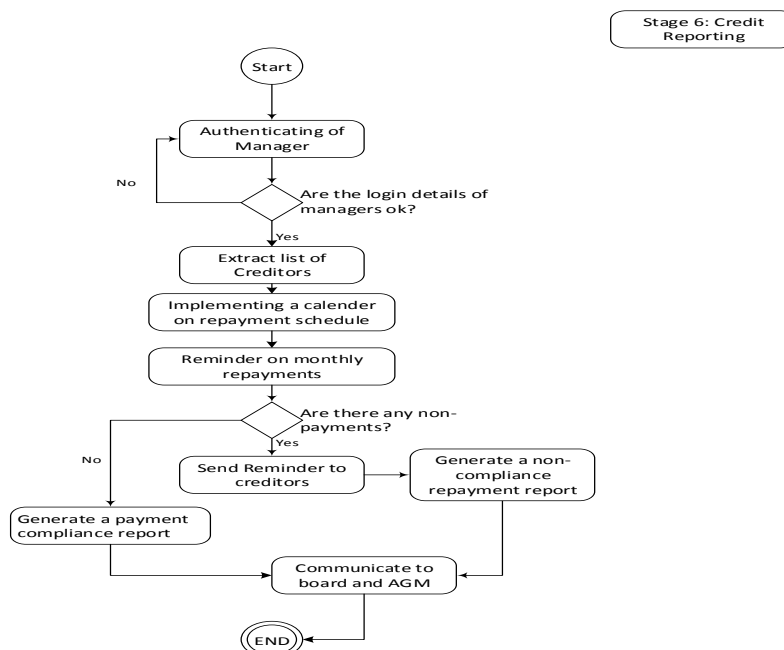


Figure 4-13, above illustrates the credit reporting sub-process presented as the credit reporting suite in these DECAF models. This suite is pretexted on the basis that credit has already been dispatched to the respective applicants that qualified after a thorough credit screening process. Danso, (2015) specifies that the process of credit facilitation is not communicating until the credit status is reported. The credit reporting suite starts with user authenticating in order to ensure that only the key user accesses the platform. The cooperative manager then extracts a list of debtors in comparison with the repayment calendar or schedule for the credit dispatched. The model provides a schedule due on a monthly basis that ought to be followed by the debtors. The manager then extracts a report on whether there has been compliance or non-compliance in return to the set payment schedule which is a point on decision making for the cooperative leaders that is AGM representatives, board representatives and the cooperative manager.

The way of governance represents the blueprint embedding the DECFA studio and integrating its suites within the credit facilitation decision making activities. Governance in service systems to include service frameworks, coordination, trust and controls Tan et al. (2009). The way of governance describes the management aspects surrounding the use of the DECAF platform. Special to note are the guidelines that regulate the interaction and engagement processes, information accessibility, use and inputting of the information in the studio. The following guidelines should be reflected on if decisions are to be enhanced in a multi-stakeholder environment; OFR, (2015) emphasizes the importance of data integrity in informal financial institutions, in an effort to ensure the above, DECAF emphasizes adherences to the principles of registration for every user before accessing the studio. The registration is based on the recognized users who include cooperative members, managers, board representatives, AGM representatives, external lenders. Once a user is registered they shall be able to view and use the suites as per their extent of accessibility rights and decision making liability. All the users on the DECFA must belong to a registered agricultural cooperative this will be verified by the administrators except the external lenders who will have special rights by the virtual that they are providing external capital to the cooperatives. All the users on the DECFA must ensure that they adhere to the set regulations in order to promote trust, commitment and involvement in the decision process.

Conclusions

In conclusion therefore, the design process produced a six sided model, with each model representing a decision process in credit facilitation and these were user management; internal capitalization; externally capitalization; credit terms; credit screening and credit reporting. Each of the different models representing a credit facilitation process and the respective decisions being enhanced. This was enriched with a set of recipes and guidelines for using each of the models. This model can be implemented using an internet supported interface to make the suites operational to the cooperatives managers. Also this Approach is user needs -based and is therefore able to fit and address the original decision challenges of cooperative managers and thus improving on their ability to extend credit to the members.

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